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# ON THE THORACOLUMBAR DISC HERNIATION WITH SPECIAL REFERENCE TO ITS MYELOGRAM

by

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Since MIXTER and BARR in 1934 established the herniation of the intervertebral disc as a distinct clinical entity, many works have been done on the pathology, clinical features and treatment of the herniated cervical and lumbar disc. But the surgery of the thoracic intervertebral disc herniation have been a relatively unknown field because of the rarity of the lesion and difficulty in diagnosis contrasted with other spinal cord involvements in the thoracic region. Only 4 cases in Japan and 108 cases in foreign lands have been found in the literature. The result of surgical intervention of this lesion have been usually poor.

The herniation of thoracic intervertebral discs occur most often in the thoracolumbar region. Two thirds of the involvements have been found in this region and they reveal characteristic figure in myelogram.

The purpose of this paper is to report three cases of thoracolumbar disc herniation, especially their characteristic myelograms, and to criticize some statistical data obtained by review of the literature.

## CASE REPORTS

Case 1. - A driver, aged 28 years, was admitted to Keio-Gijuku University Hospital with the chief complaint of difficulty in walking. Four years previously he noticed numbness and weakness of both lower extremities without any history of trauma. He was treated by a physician under the diagnosis of beriberi or neuralgia without any evidence of improvement. Three months ago he had low back pain radiating to the right thigh. Gradually his difficulty in walking developed. Some frequency of micturition has been noticed for more than one year.

On examination, spastic gait with drop feet, paraplegia, muscular atrophy and fascicular twitchings in both lower limbs were observed. Knee and ankle jerks were bilaterally exaggerated. Ankle clonus was present but BABINSKI'S sign was negative. Cutaneous sensory impairment and depressed vibration sense were found out up to the L1 dermatome on the right side and to the S1 on the left. The abdominal reflex was absent in the lower portion, but normal in the middle and upper portion. Cremaster reflex was also normal.

At lumbar manometry pressure was 115mm of water with negative QUECKENSTEDT'S test. Cerebrospinal fluid was clear, 9 cells/3 per cubic millimeter and positive PANDY and NONNE-APELT'S test.

Roentgenograms showed moderately reduced T11-12 and T12-L1 interspaces especially at the posterior portion, SCHMORL's nodules at T9, T10 and T11 and Kyphosis dorsalis juvenilis (SCHEUERMANN) at the thoracolumbar vertebrae.

Myelogram showed incomplete block at T11-12 and T12-L1 interspaces. The column of the contrast medium stopped at T10, T11 and its leading edges lay just above the T11-12 disc space. A small amount of the contrast medium occupied the right side of T12. Bilateral root sleeves were clearly discernible. The leading edges were clear cut in the lateral borders but vague in the medial borders (Fig. 1a). The column of the contrast medium displaced posteriorly in the lateral film (Fig. 1b). Twenty hours later the residual moljodol took a figure of "moustache" (Fig. 2).



Fig. 1a

Fig. 1b

Fig. 2

At operation herniation of T12-L1 disc was removed but also a slightly bulged T11-12 disc was left untouched. The spinal cord was found to be displaced posteriorly especially in T12-L1.

Postoperatively low back pain soon disappeared. But the recovery of the spinal cord palsy was unsatisfactory.

Case 2. A clerk, aged 33 years, has noted low back pain and weakness of lower limbs for ten years. Disturbances of bladder and bowels have developed since seven months. There was no history of trauma.

Examination revealed kyphosis of slight degree. Muscular atrophy of the lower limbs and claw-toes were observed. Knee jerks decreased and ankle jerks absent. Positive LASEGUE's test. Cutaneous sensory depression up to the S1-2 segment.

Roentgenograms showed a narrowing of the T11-12 disc space. In lateral films concave lens shaped deformity and osteophyte of the adjoining vertebral bodies were visible. Myelogram showed a filling defect at the T11-12 disc space and the leading edges of contrast medium were obscure. The root sleeve of the 11th thoracic nerve was perceived on the right side.

At operation herniation of the T11-12 disc mainly hard was completely removed. Postoperatively the patient recovered uneventfully.

Case 3. A worker, aged 22 years, has complained of low back pain over a period of two years. Two years and six months previously he failed to make somersault, striking his back. Since eight months urinary retention has appeared, becoming gradually worse. Sexual potency has been normal.

On examination, a kyphosis and left convex scoliosis was found at the thoracolumbar part. Hyperextension was markedly limited but there was no stiffness and tenderness. LASEGUE'S sign was bilaterally positive. Muscular atrophy in the lower limbs was not observed. Remarkable claw-toes were present. Movement of lower limbs was inactive. No increased extensor responses and negative pathologic reflexes. Cutaneous sensory depression up to the S3 dermatome. Absent cremasteric reflex on the left side.

Lumbar manometry was normal.

Roentgenograms showed Kyphosis dorsalis juvenilis (SCCHEUERMANN) in the thoracolumbar vertebrae. Wedge shaped deformity and osteophyte in the T11, T12 and L1 vertebrae. Concave lens like deformities in the adjoining vertebral bodies of the T10-11 interspace (Fig. 3).

Myelogram showed incomplete block at T11 and T12. Leading edges of the contrast medium lay at T11-12, T12-L1 disc space and it took the characteristic figure of "moustache" (Fig. 4a). Posterior deviation of the column of the contrast medium was observed in the lateral film (Fig. 4b).

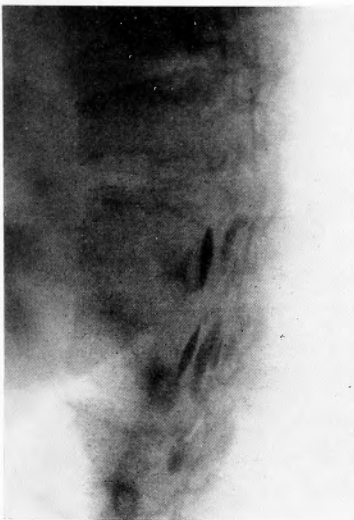


Fig. 3

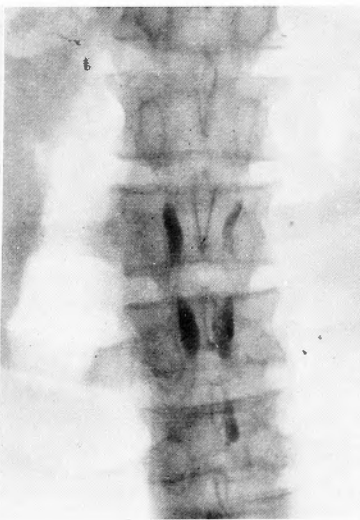


Fig. 4 a



Fig. 4 b

At operation laminectomy was performed at L1, T12 and T11. The dura was opened. The arachnoid was tightly adherent to the spinal cord and to the anemic nerve root. Herniation in the T12-L1 disc was extradurally removed but there remained a bone-ridge at the upper border of L1 vertebra. Prominence of the T11-12 interspace was not remarkable.

Postoperatively no remarkable improvement was gained.

## DISCUSSION

### 1. Statistical Analyses

Herniated thoracic discs are relatively rare conditions and only 112 cases were found in the literature. One hundred and fifteen herniated discs were available for this statistical analyses.

Incidence : From 1929 through 1962 34 cases of cervical and 195 cases of lumbar disc herniations have been verified at operation at our clinic. Three cases of the herniated thoracolumbar disc in this series amount to 1.3 per cent of total 232 disc herniations.

Age and Sex : Age groups of thoracic disc herniations disperse widely from the youngest 12 years old to the oldest 73. But they accumulate to the age group from the

TABLE 1

Age distribution of thoracic disc herniation

YEARS	CASES
1~10	0
11~20	3
21~30	12
31~40	18
41~50	24
51~60	19
61~70	8
71~80	2
Total	86

20th to the 40th and the summit lies in the 40th of age (Tab. 1). It gives a clear contrast to the lumbar and cervical disc herniation as the lumbar disc affected

mainly in the 20th of age and cervical disc in the 40-50th. All seven cases in our country are much younger, the 20-30th of age. This might be due to some difference between foreign and Japanese cases but they are too small to be significant.

Sex incidence is dominant in males, for males are 53, 62 per cent and females 34, 38 per cent.

Site and position : Thoracic intervertebral disc herniations have a favorite site of affection in the thoracolumbar portion as the cervical disc herniation in C5-6, C4-5 and the lumbar in L4-5, L5-S1. Sixty five cases, 60 per cent of total herniated thoracic discs were found in this part, namely T10-11~T12-L1 disc spaces (Tab. 2). High incidence in this region may be ensued from mechanical effect in the transitional zone of spinal curvature between the fixed thoracic and movable lumbar spine, and the greatest weight bearing of the lowest thoracic disc.

The herniations commonly situate in the midline and lateral herniations are rare.

TABLE 2

Distribution of the lesion in thoracic disc herniations

AFFECTED DISC	No. of CASES
T 1~ 2	1
T 2~ 3	0
T 3~ 4	0
T 4~ 5	4
T 5~ 6	5
T 6~ 7	9
T 7~ 8	4
T 8~ 9	8
T 9~10	12
T10~11	12
T11~12	36
T12~L1	17
Total	107

## 2. Clinical features

Clinical features of thoracolumbar disc herniations are chronic progressive spinal paraplegia identical with anterior extradural tumour of the spinal cord but the courses are more insidious and sometimes remittent.

Low back pain, weakness and numbness of lower limbs are noticed at first, later difficulty in walking is predominant. Sphincter disturbances and insufficiency of sexual potency are sometimes remarkable, for this lesion lies at the medullary conus. Local signs are mainly low back pain, kyphosis and scoliosis in the affected disc region.

Often it lacks radicular pain differing from extramedullary tumour and making a striking contrast to the herniated lumbar disc. It may depend upon the facts that the midline situated herniations sometimes make no irritation to the nerve root and if it does the compression of the spinal cord has already developed. The radicular pain radiates to the lower abdomen. It is sometimes mistaken for the referred pain of the abdominal viscera. Even the operation would be performed under the misdiagnosis of appendicitis, stones of the urinary tract etc. Several degrees of spinal cord involvements are the signs of earlier stadium such as spastic palsy, atrophy of lower extremities, ankle and patellar clonus and positive BABINSKI's sign. Sensory impairment may be appeared in the sacral segment due to relationship of the thoracolumbar disc to the spinal segment.

## 3. Cerebrospinal fluid

Lumbar manometry may be normal or reveal incomplete and complete block according to the degrees of herniation to the subarachnoid space. Cerebrospinal fluid may contain increased protein and normal numbers of lymphocytes but without xanthochromia.

## 4. Plain roentgenogram

Many characteristic changes are seen on roentgenograms because the duration of the involvement would be chronic.

These changes are summarized as follows, 1. narrowing of the affected disc space, 2. localized osteoarthritic changes such as osteophyte on the posterior borders of vertebral bodies. 3. wedge shaped deformities of adjoining vertebrae (Kyphosis dorsalis juvenilis SCHEUERMANN), 4. concave lens shaped deformity, 5. abnormality of spinal curvature, 6. calcification of nucleus pulposus, 7. SCHMORL's nodules in the other parts of vertebral bodies.

We have not encountered to the calcified nucleus pulposus which was first detected by LOGUE (1952). KYPHOSIS dorsalis juvenilis (SCHEUERMANN) was found in two of our three cases. Combination with this deformity was also reported by MÜLLER (1951) and Van LANDINGHAM (1954), so there may be some correlation between these two disorders.

## 5. Myelogram

It leaves no room for doubt that the myelogram has unmeasurable value to ascertain the space-occupying disorders in the spinal canal. It is not only diagnostic but also pathognomonic in the thoracolumbar disc herniation as it reveals the characteristic figure of "moustache". It shows total or partial blockage of the contrast medium just above the affected disc and took a figure of "moustache". The leading edges of the contrast medium were clear cut in the lateral borders but vague in the medial borders. The root sleeves were clearly discernible. In the lateral film the

column of the contrast medium displaced posteriorly.

The cause of this typical figure may be explained by the following hypothesis. The contrast medium is apt to accumulate only in the root sleeve due to intimate position of the nerve root to the herniation just beneath. At the same time crowdedness of nerve roots in this part may play some role (Fig. 5).

### 5. Prognosis

The prognosis is the gravest of all disc lesions. Difficulty in surgical approach to the midline situated herniation, anatomical disadvantages at the relatively narrow spinal canal, vulnerability of the lumbar ampulla and hard calcification of the herniations are the main causes to make the result poor or even to ensue the spinal cord injury. Great care must be taken to avoid the transverse lesion due to surgical procedures.

Shorter the period of operation from onset, better the result. In order to avoid misdiagnosis and to diminish the irreversible changes of the spinal cord, this lesion should always be born in mind if there were any signs of spinal cord involvement without affection of the upper limbs.

### 6. Treatment

We have no experience of conservative treatment.

Surgery should be demanded when there were any signs of spinal cord involvement. If they were neglected, the prognosis will be always poor because of irreversible degeneration of the spinal cord due to longstanding compression.

Surgical approaches are divided into three groups namely posterior, lateral and anterior. Posterior route is most common.

Using the posterior route, laminectomy must be performed as wide as possible to facilitate the procedures in the spinal canal. It is advisable to open the dura mater to confirm the degree of spinal cord degeneration and to avoid the mechanical effect of the instrument to the spinal cord even if the removal of tumour would be possible extrathecally. Extradural approach may be enough to remove the laterally situated herniation. If the disc herniated at the midline perdural approach is useful and to divide the dentate ligament is imperative and even to cut off a nerve root to facilitate the procedure will be admitted. Whole procedure must be performed carefully to avoid the spinal cord injury particularly in the case of hard disc. Decompression by the division of dentate ligament is the method of choice if the removal of the herniated disc is too dangerous.

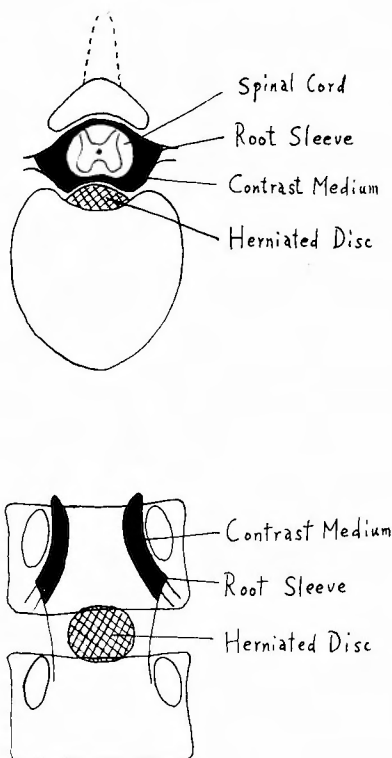


Fig. 5

HULME in 1960 advocated a lateral approach through intervertebral foramen, a variation of costotransversectomy and obtained a good result, but we have no experience in this operation.

Recent progress in anaesthesiology and chest surgery made it possible to use the anterior approach through thoracotomy with the fusion of vertebral bodies.

But these methods have common disadvantages not to visualize the spinal cord, their estimation must be convinced by further experiences.

### SUMMARY

Three cases of thoracolumbar disc herniation were reported and some aspects of their myelogram were discussed.

Statistical analyses of herniated thoracic discs were made and clinical features, roentgenograms, treatment and prognosis of thoracolumbar disc herniations were described in some details.

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## 和 文 抄 録

# 胸腰移行部椎間板ヘルニアとくにその ミエログラムについて

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胸腰移行部椎間板ヘルニアの3症例を報告し、特にそのミエログラムにつき述べる。

本疾患は稀で自験全椎間板ヘルニア手術例232例の1.3%にすぎない。

臨床像は慢性進行性截瘡で脊髓腫瘍に類似するが一層経過が永く、時に弛張を示す。初発症状として背腰痛、下肢脱力感、痺れ等を訴え歩行障害を来して来院する。既往に神経痛といわれ、脚気、内臓疾患等と誤診されているものが多い。

髄液に鬱滞所見を呈したものが1例ある。

レ線と顯性椎間腔の狭縮、限局性変形性変化即ち棘形成、椎体辺縁隆起、隣接椎体の楔状及び魚椎状変形、脊柱彎曲異常、シユモール結節などをみる。2例において少年性亀背の合併をみたことは興味がある。

ミエログラムは特徴的で、それはバナナの房状或は八の字状の定型像である。沃度油は罹患椎間板直上で、八の字状の末拡がりの像を描いて停留し、両側に

明らかな根囊像を描出する。両側の下縁は比較的境界明瞭であるが中央は薄ボケている。側面像では後方に圧排されている。八の字型定型像の成因としては多数の神経根が密集しているところへ、胸髄神経根起始部直下に腫瘤が存在するため、沃度油が根囊部にのみ停留するためであると理解される。

他部のものに比して予後は悪い。それはヘルニアが脊髓前方正中線上にあることが多く、石灰沈着、骨提等になつていこともあり、腫瘤占在部位が腰膨大部に相当し、手術的侵襲の困難なことに帰せられる。

治療は椎弓切除腫瘤剔出術を理想とするが、粗暴な操作により脊髓損傷の危惧なしとしないので剔出には慎重を要する。Hulmeは肋骨横突起切除により椎間孔から剔出を行ない良好な結果を得ており、また、開胸により前方から侵襲し、脊柱固定を併用する術式も考えられるが、これらの批判は今後の経験に俟たねばならない。